

10—New Western Australian species of *Thysanotus* R.Br. (Liliaceae)—2

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Abstract

A proposal is made to emend the circumscription of the genus *Thysanotus* so as to include taxa possessing trilocular ovaries with from 2-20 ovules per loculus, in place of 2 ovules per loculus as at present.

Ten new species are described and illustrated—*T. acerosifolius*, *T. brachiatulus*, *T. brachyantherus*, *T. nudicaulis*, *T. parviflorus*, *T. pyramidalis*, *T. ramulosus*, *T. sabulosus*, *T. speckii*, all belonging to the section of the genus with six stamens and *T. teretifolius* belonging to the section with three stamens. *T. nudicaulis* is noteworthy in that it has a distribution which extends to Eyre Peninsula, South Australia.

Introduction

The original circumscription of the genus *Thysanotus* (Brown 1810) characterises the ovary as "Ovarium loculis dispermis", the capsule 3-loc. . . ." and the seeds "Semina bina, . . .". Later workers confirm these, e.g. Bentham (1861) "Ovary 3-celled, with 2 ovules Capsule 3-valved. Seeds (when both ripen)"; Baker (1877) "Ovarium sessile oblongum, ovulis in loculo geminis;" and "Capsula membranacea globosa loculicide trivalvis . . ." and Bentham (1878) "Ovary . . . , 3-celled, with 2 superposed ovules in each cell;" and "Capsule . . . 3-valved. Seeds 1 or 2 in each cell, . . .".

It has been found that the distinctive floral characteristics of the genus such as the possession of fringed inner perianth members, a particular anther morphology and staminal arrangement may be associated with trilocular ovaries containing up to 17 ovules per loculus (*T. brachyantherus* sp. nov.—6-8 and *T. nudicaulis* sp. nov. 10-17). These taxa warrant inclusion within the genus *Thysanotus*. It is therefore proposed to emend the generic description by substituting 'ovules 2-20 per loculus' and 'Capsules 3-valved with up to 50 seeds'.

Thysanotus R.Br. emend. N. H. Brittan.

Ovarium triloculare, utroque loculo ovulis 2-20.

Capsula 3-valvata, usque ad 50 seminalis.

Typus:—*T. juncifolius* (Salisb.) Willis et Court.

1. *T. acerosifolius* N. H. Brittan sp. nov.

Holotypus:—Pallarpur Rocks, ca 31 miles N. of Ravensthorpe, Brittan 60/128-1, 14.xii.1960 (UWA) (Fig. 1).

Isotypi:—Brittan 60/128-2 (MEL), 60/128-3 (K), 60/128-4 (CANB), 60/128-5 (PERTH).

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Herba perennis; caudex 5-15 mm dia., bracteis et basibus foliorum persistentibus circumcinctus. Tubera ellipsoidea-cylindrica, glabra, flavida, 1.5-5 cm longa, 4-7 mm dia., in radicibus fibrosis 4-9 cm longis. Folia 10-15, filiformia, glabra, 9-24 cm longa, prope basin membranaceo-marginata. Inflorescentia 15-30 cm alta, plerumque in summis 2 cm ramificans. Scapus erectus, teres, glaber, infra ramum primum ebracteatus. Bractee inflorescentiae 3-4 mm longae, acutae, uninervatae. Umbellae circa 4-florae terminales. Bractee umbellarum late-ovatae, 1-2-nervatae, 2-2.5 mm longae membranaceae. Pedicelli 6-7 mm longi, e basi 2-3 mm articulati, florentes erecti, fructiferi nutantes. Flores ut in genere. Tepala exteriora linearia, 10 mm longa, 1.5 mm lata, anguste membranaceo-marginata; tepala interiora ovata, fimbriis 2-3 mm longis fimbriata. Stamina 6; antherae strictae, non tortae, dorsifixae, loculi basi breviter divergentes, poris terminalibus dehiscentes; 3 exteriores 4 mm longae; 3 interiores 3 mm longae. Ovarium sessile, triloculare, utroque loculo ovulis 2. Stylus terminalis, erectus, strictus. Capsula immatura ab perianthio persistenti inclusa. Capsula matura et semina non visa.

Perennial herb, rootstock 5-15 mm dia., enclosed by bracts and persistent leaf bases of previous years' growth. Roots fibrous, expanding into cylindrical-ellipsoidal tubers at 4-9 cm from rootstock. Tubers glabrous, yellowish, 15-50 mm long, 4-7 mm dia. Leaves 10-15 produced per season, filiform, glabrous, 9-24 cm long, with membranous wings towards the bases. Inflorescences paniculate, 15-30 cm tall, branching usually only in uppermost 2 cm. Scrape erect, terete, glabrous, ebracteate below first branch. Bracts subtending lower inflorescence branches 3-4 mm long, acute, single-veined. Umbel bracts broadly ovate, membranous, translucent, 2-2.5 mm long, 1-2-veined, upper margins dentate between vein ending and margin. Pedicels 6-7 mm long, articulate 2-3 mm from base, erect in flower, nodding in fruit. Flowers as in genus. Outer tepals linear, 5-veined, 10 mm long, 1.5 mm wide, with narrow membranous margins; inner tepals with opaque centre portion, 3-veined, tapering to an acute point, lamina ovate, surrounded by fringe 2-3 mm wide. Stamens 6; anthers straight not twisted, dorsifix, base of anther projecting beyond point of insertion of filament as two lobes, dehiscence by terminal pore, 3 outer anthers 4 mm long, 3 inner 3 mm long. Ovary sessile, trilocular, 2 ovules per loculus, surmounted by straight, erect, style. Immature capsule enclosed within persistent perianth. Mature capsule and seeds not seen.

This species most closely resembles *T. brevifolius* N. H. Brittan (Brittan 1960), from which it differs in the paniculate inflorescence, the shorter, narrower leaves and the marked accumulation of past seasons' leaf bases.

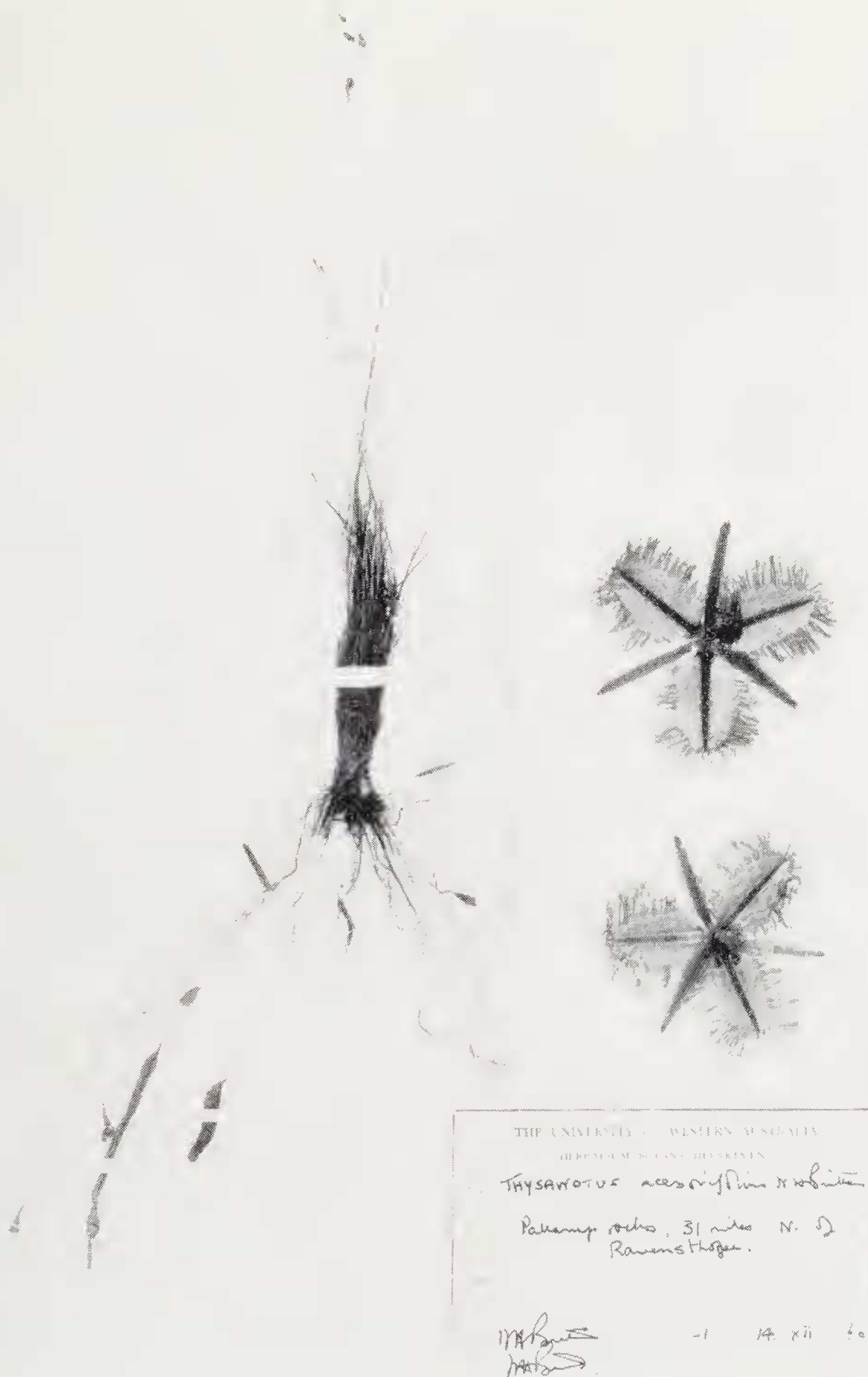


Figure 1.—*Thysanotus acerosifolius* N. H. Britton—Holotype: Britton 60/128-1 (UWA), x 0.5; flower x 1.5.



Thysanotus brachiatus
 N. H. Britton
 N. A. Eyre Range
 — ca 21 m. ssw. Ravenshoe

N. H. Britton 60/81-1 3.xii 60

Figure 2.—*Thysanotus brachiatus* N. H. Britton—Holotype: Britton 60/81-1 (UWA), x 0.5; flower x 2.0.

Other specimens:— Type locality, *George* 2259, 14.xii.1960 (PERTH); 7 miles W. of Newdegate on Newdegate-Lake Grace road, *Brittan* 60/135, 15.xii.1960 (UWA).

2. *T. brachiatus* N. H. Brittan sp. nov.

Holotypus:— N. of Eyre Range, ca 21 miles S.S.W. of Ravensthorpe, *Brittan* 60/81-1, 3.xii.1960 (UWA) (Fig. 2).

Isotypus:— *Brittan* 60/81-2 (K).

Herba perennis. Rhizoma \pm globosum, circa 7 mm dia. vel cylindricum, horizontale ca 1 cm dia., 3-4 cm longum, testaceum, reliquias bractearum membranacearum obiectum. Radices fibrosae haud tuberosae. Planta aphylla; 1-2 caules aeri; bracteae radicales 2-4, membranaceae, anguste-lanceolatae, 1.5-2.5 cm longae, 2 mm latae. Caulis basin versus teres, dense tuberculatus, supra porcatius, glaber, 19-25 cm altus, divaricate ramosus; ramus infimus plerumque 1-ramosus. Spicae condensatae terminales. Bracteae spicarum exteriores 2, late-deltoidae, circa 1 mm longae, ad basin 1 mm latae, herbaceae, interiores anguste-deltoidae, 1.25-1.5 mm longae, herbaceae. Spicae ad 8-florae. Pedicelli erecti, circa 4 mm longi, e basi circa 1 mm articulati. Flores ut in genere. Tepala exteriora angustissime-lanceolata, anguste membranaceo-marginata, 7-8 mm longa, 1.5 mm lata, mucronata, dorsalter obscure 5-nervata; tepala interiora elliptica, 3-4 mm lata, fimbriis circa 3 mm longis fimbriata. Stamina 6; antherae flavidae, apicem versus dilute-purpureae, basifixae, poris terminalibus dehiscen-tes; 3 exteriores \pm strictae, parum tortae, 3 mm longae; 3 interiores curvatae, tortae, circa 5 mm longae; fila-menta 2.5 mm longa. Ovarium sessile, cylindricum, triloculare, utroque loculo ovulis 2. Stylus terminalis, curvatus, circa 4 mm longus. Capsula immatura circa 3 mm longa, ab perianthio persistenti inclusa. Capsula matura et semina non visa.

Perennial herb. Rootstock a rhizome, \pm spherical ca 7mm dia. to horizontal, cylindrical, up to 1 cm dia., 3-4 cm long; pale brown, covered with remnants of membranous bracts. Roots fibrous not tuberous. Plant leafless, aerial stems usually 2 per plant, enclosed by 2-4 radical bracts, the bracts membranous, narrow-lanceo-late, 1.5-2.5 cm long, 2 mm wide. Stems terete, 19-25 cm tall, densely tuberculate to retrorsely hirsute in lower parts, upper ridged, \pm glabrous; divaricately branched, usually 1-2 sterile bracts below first branch, lowest branch often branched, others simple. Stems apparently persisting for a second year, further branching occurring from nodes on main stem and branches. Condensed spikes terminating branches, outer bracts usually two, herbaceous, broadly deltoid, ca 1 mm long, 1 mm broad at base, inner bracts herbaceous, narrow-deltoid, 1.25-1.5 mm long. Spikes up to 8-flowered, pedicels erect in flower and fruit, ca 4 mm long, articulate ca 1 mm from base. Flowers as in genus. Outer tepals very narrow-lanceolate, narrowly membranous-margined, 7-8 mm long, 1.5 mm wide, mucronate, dorsally obscurely 5-nerved. Inner tepals elliptical, 3-4 mm wide, fimbriate, fimbriae ca 3 mm long. Stamens 6; anthers yellowish with pale purple tips, basifixed, dehiscing by terminal pore; 3 outer \pm straight, slightly twisted, 3 mm long; 3 inner curved, twisted, ca 5 mm long; filaments 2.5 mm long. Ovary sessile, cylindrical, tri-locular, ovules 2 per loculus. Style terminal, curved, ca 4 mm long. Immature capsule ca 3 mm long, enclosed by persistent perianth. Ripe capsule and seed not seen.

In general habit this species approaches some specimens of the Eastern Australian *T. junci-folius* (Salisb.) Willis et Court. It differs in the greater number of flowers per 'umbel'—here more correctly condensed spikes—and in the de-velopment of a dense tuberculate indumentum in the lower parts of the stems; *T. juncifolius* is typically hirsute in this region.

Other specimens:—ca 40 miles W. of Ravens-thorpe, *Brittan* 60/76, 1.xii.1960 (MEL); Culham Inlet road, N. of Hopetoun, *Brittan* 60/85, 4.xii.1960 (UWA); 70 miles E. of Ravensthorpe, Ravensthorpe-Esperance road, *Brittan* s.n., 13.xii. 1951 (UWA); 26 miles W. of junction Esperance-Ravensthorpe road with the Norseman road, *Brittan* 60/119, 13.xii.1960 (PERTH).

3. *T. brachyantherus* N. H. Brittan sp. nov.

Holotypus:—In sand plain, nr. Russell Range, ca 100 miles E. of Esperance, *Brittan* 60/95-1, 8.xii.1960 (UWA) (Fig. 3).

Isotypi:—*Brittan* 60/95-2 (K), 60/95-3 (MEL).

Herba perennis; caudex parvus. Tubera ellipsoidea 3-4 cm longa in radicibus fibrosis 5-7 cm longis. Folia radicalia, 4-5, plus minusve teretia, basi membrana-cea-marginata, circa 15 cm longa, glabra, marcescentia plerumque ante anthesin. Inflorescentia paniculata, raro racemosa. Scapus teres, glaber. Bracteae ramorum infimorum deltoideae, anguste membranaceo-marginatae, acuminatae-caudatae, 5-12 mm longae. Umbellae 1-4-florae, terminales, raro sessiles. Bracteae umbellarum late deltoideae, membranaceae, 1.5-2 mm longae. Pedicelli 5-7 mm longi, e basi 1.0-1.5 mm articulati. Flores ut in genere. Tepala exteriora linearia, mem-branaceo-marginata, 9 mm longa, 1.5 mm lata; tepala interiora elliptica, 3.5 mm lata, fimbriis 3 mm longis fimbriata. Stamina 6; antherae 3 exteriores parum curvatae, parum tortae, 3 mm longae; antherae 3 interiores parum curvatae, valde tortae, 2 mm longae; fila-menta 2.5 mm longa. Ovarium sessile, globosum, triloculare, utroque loculo ovulis 6-8. Stylus erectus, 3 mm longus. Capsula immatura plus minusve globosa, ab perianthio persistenti inclusa. Capsula matura et semina non visa.

Perennial herb, rootstock small with clustered fibrous roots becoming swollen 5-7 cm from stock into ellipsoidal tubers 3-4 cm long. Scape surrounded by 4-5 membranous-based, \pm terete, glabrous leaves up to 15 cm long, marcescent, usually before flowering. Inflorescence 1, occasionally 2, usually a panicle, in some speci-mens reduced to a raceme of umbels. Scape terete, glabrous, bracts at lowest branch 5-12 mm long, triangular, with narrow membranous mar-gins, acuminate to caudate apex. Umbels 1-4-flowered, usually terminal on branches or branchlets, occasionally sessile. Umbel bracts membranous except for vein, broadly deltoid 1.5-2 mm long. Pedicel 5-7 mm long, articulate 1-1.5 mm from base. Flowers as in genus. Outer perianth 9 mm long, 1.5 mm broad, linear with membranous margins; inner perianth 3.5 mm wide, elliptical, fimbriate except for 2 mm at base, fimbriae 3 mm long. Stamens 6; 3 outer anthers slightly curved, slightly twisted, 3 mm long; 3 inner anthers slightly curved, markedly twisted, 2 mm long; filaments 2.5 mm long. Ovary sessile, spherical, trilocular, ovules 6-8 per loculus. Style straight, 3 mm long. Immature capsule enclosed by persistent peri-anth, \pm globular. Mature capsule and seeds not seen.

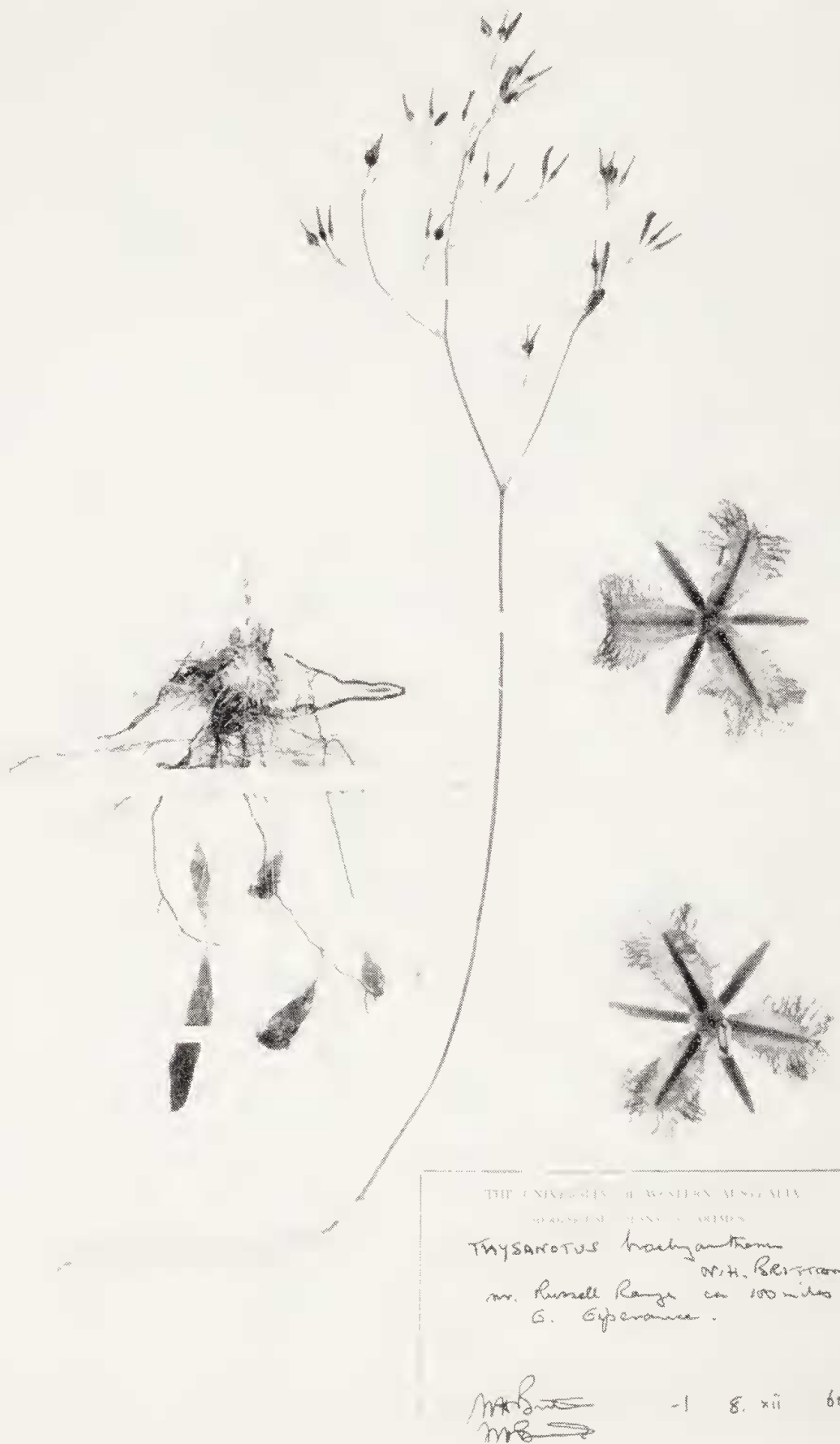


Figure 3.—*Thysanotus brachyantherus* N. H. Brittan—Holotype: Brittan 60/95-1 (UWA, x 0.5; flower from Brittan 60/93 (x 1.5).

The inflorescence of this species has the general habit of luxuriant specimens of *T. cymosus* N. H. Brittan (Brittan 1960) but differs in the anthers, which are markedly twisted, particularly the smaller whorl, in comparison with the anthers of *T. cymosus* which are not twisted and also show a marked projection of the loculi below the point of insertion of the filament. It is also the case, in the specimens so far seen, that the leaves are marcescent earlier than in *T. cymosus*.

Other specimens:—Junction of Balladonia, Israelite Bay and Esperance tracks, near Mt. Ragged, ca. 110 miles E. of Esperance, Brittan 60/93, 8.xii. 1960 (UWA), same locality and date, George 2117 (PERTH).

4. *T. nudicaulis* N. H. Brittan sp. nov.

Holotypus:—65 miles E. of Esperance on Israelite Bay track, Brittan 60/106-1, 11.xii.1960 (UWA) (Fig. 4).

Isotypi:—Brittan 60/106-2 (K), 60/106-3 (MEL), 60/106-4 (PERTH).

Herba perennis: caudex parvus. Tubera angustellipsoidea 2-3 cm longa, 5-6 mm dia., in radicibus fibrosis circa 8 cm longis. Bractae radicales 3-4, lineares, apices acutae, 4-5 cm longae, 3 mm latae, membranaceae. Folia radicalia, 1-2, supra semiteretia vel obscure angulata, basin versus membranaceo-marginata semi-vaginantia, 12-30 cm longa, scabriuscula, marcescentia plerumque ante anthesin. Inflorescentia simplex, raro paniculata. Scapus teres, glaber, bractea 1 (raro 2) sterili, 5-7 mm longa. Rami inflorescentiae simplices, 1-2 cm longi, raro infimi 3 cm longi. Umbellae terminales, 1-4-florae; bractae exteriores late-ovatae, herbaceae, anguste membranaceo-marginatae; bractae interiores membranaceae, nervis fuscis. Pedicelli 7-10 mm longi, e basi circa 2-3 mm articulati. Flores ut in genere. Tepala exteriora 13-17 mm longa, 1.5-3 mm lata; tepala interiora angustiovata, 4.5-6 mm lata, fimbriis 2-4 mm longis fimbriata. Stamina 6; antherae 3 exteriores curvatae, tortae, 7.5-10 mm longae; 3 interiores strictae, tortae, 3-4 mm longae; filamenta 2-3 mm longa. Ovarium sessile, triloculare, utroque loculo ovulis 10-17. Stylus erectus, curvatus. Capsula 7 mm longa, 3 mm dia., ab perianthio persistenti inclusa, 30-50 seminalls. Semina nigra, complanata, 1 x 1 x 0.75 mm.

Perennial herb; rhizome small and \pm erect. Roots swollen at 3-8 cm from stock into narrow ellipsoid tubers 2-6 cm long, 5-6 mm dia. leaves \pm marcescent before flowering, 1-2, terete, glabrous-scabridulous, 12-30 cm long. 1-4 membranous bracts 4-5 cm long, 3 mm broad, enclosing current year's leaves, themselves enclosed by remnants of previous years' leaf bases and bracts. Inflorescence a simple scape with single terminal umbel, in luxuriant specimens becoming paniculate. Scape 12-50 cm tall, terete, usually with one (occasionally 2) sterile, narrow-deltoid bracts 5-10 mm long. In paniculate specimens, peduncles of umbels 5-20 mm long (occasionally 30 mm long) subtended by deltoid bract ca 3-5 mm long. Umbels 1-4-flowered, bracts 3-5 mm long, outer bract broadly ovate-triangular with narrow membranous margins, inner bracts membranous with dark vein. Pedicels erect in flower and fruit, 7-10 mm long, elongating in fruit up to 20 mm, articulate about one third length from base. Flowers as in genus. Outer tepals narrow-linear, 13-17 mm long, 1.5-3 mm wide; inner tepals elliptical, ca 4.5-6 mm wide, fimbriate, fimbriae 2-4 mm long. Stamens 6; three outer anthers

curved, twisted, 7.5-10 mm long; three inner anthers straight, twisted, 3-4 mm long; filaments 2.5-4 mm long. Ovary sessile, cylindrical, trilocular, with 10-17 ovules per loculus. Style curved, as long as the longer stamens. Capsule enclosed within persistent perianth, 7 mm long, 3 mm dia. Seeds black, flattened, minutely tuberculate, 1 x 1 x 0.75 mm. Seeds 30-50 per capsule.

This species in habit most closely resembles *T. formosus* N.H. Brittan (Brittan 1960) from which it differs in the production of ellipsoidal tuberous roots (those of *T. formosus* remaining narrow-cylindrical), leaves semi-terete and somewhat angular and the ovary with 10-17 ovules per loculus. It is also noteworthy in its disjunct distribution between S.E. Western Australia and Eyre Peninsula South Australia.

Other specimens:—Esperance - Ravensthorpe road, 18 miles W. of Lort River crossing, Brittan 60/121, 13.xii.1960 (UWA); 3 miles E. of Lort River crossing, Brittan 60/120, 13.xii.1960 (UWA); 19 miles W. of junction of Esperance-Ravensthorpe road with Norseman road, Brittan 60/117, 13.xii.1960 (UWA); S. of Mt. Merivale, ca 13 miles E. of Esperance, Brittan 60/109, 12.xii.1960 (UWA), same locality and date, George 2205 (PERTH); wet sandy places Esperance Bay to Le Grand, Maxwell s.n., s.d., (MEL); base of Mt. Le Grand, ca 16 miles S.E. of Esperance, Brittan 60/111, leg. George, 12.xii.1960 (UWA) (Fig. 5); slopes of Mt. Le Grand, Brittan 60/113, leg. George, 12.xii.1960 (UWA); 2 miles N. of Thomas River homestead, ca 60 miles E. of Esperance, Brittan 60/107, 10.xii.1960 (UWA); 63 miles E. of Esperance on Israelite Bay track, George 2189, 11.xii.1960 (PERTH); 12 miles S.W. of Mt. Ragged, ca 100 miles E. of Esperance, Brittan 60/91, 6.xii.1960 (UWA), same locality and date, George 2041 (PERTH); 14 miles S. of Mt. Ragged towards Israelite Bay, Brittan 60/96, 8.xii.1960, -1 (UWA), -2 (CANB); 3 miles E. of junction Mt. Ragged track and Esperance-Israelite Bay track, Brittan 60/97, 9.xii.1960 (UWA); ca 1 mile W. of Israelite Bay settlement, Brittan 60/99, 9.xii.1960 (UWA); Point Culver, ca 70 miles N.E. of Israelite Bay, Brooke s.n., 1884 (MEL); Port Lincoln, Eyre Peninsula, S.A., Brown 17 and 69, 1874 (MEL).

5. *T. parviflorus* N. H. Brittan sp. nov.

Holotypus:—W. slopes of West Mt. Barren, ca 60 miles S.W. of Ravensthorpe, Brittan 60/73-1, 29.xi.1960 (UWA) (Fig. 6).

Isotypi:—Brittan 60/73-2 (K); 60/73-3 (MEL).

Herba perennis. Rhizoma parvum, bracteis et basibus foliorum persistentibus circumcinctum. Radices carnosulae 1.5-2.0 mm dia. non tuberiferae. Scapus et folia 1 vel 2 bracteis membranaceis circa 4 mm longis subtenti. Folia 1 vel 2 anguste-linear, teretia, glabra, 10-25 cm longa, basi in vaginas membranaceo-marginatas expansa, sub anthesi praesentia. Scapus inflorescentiae 14-25 cm altus, teres, glaber, apice 2-4-ramosus. Rami 1.5-4 cm longi, bracteis deltoideis 4-6 mm longis, membranaceo-marginatis subtenti. Umbellae binae ramosae florentes terminantes, raro umbella sessilis infra summum. Umbella ab bractea late-ovata, 3 mm longa, acuminata, anguste membranaceo-marginata inclusa. Bractae interiores angustiovatae, membranaceae, nervis purpureis. Umbellae 4-6-florae, pedicellis florentibus erectis, fructiferis

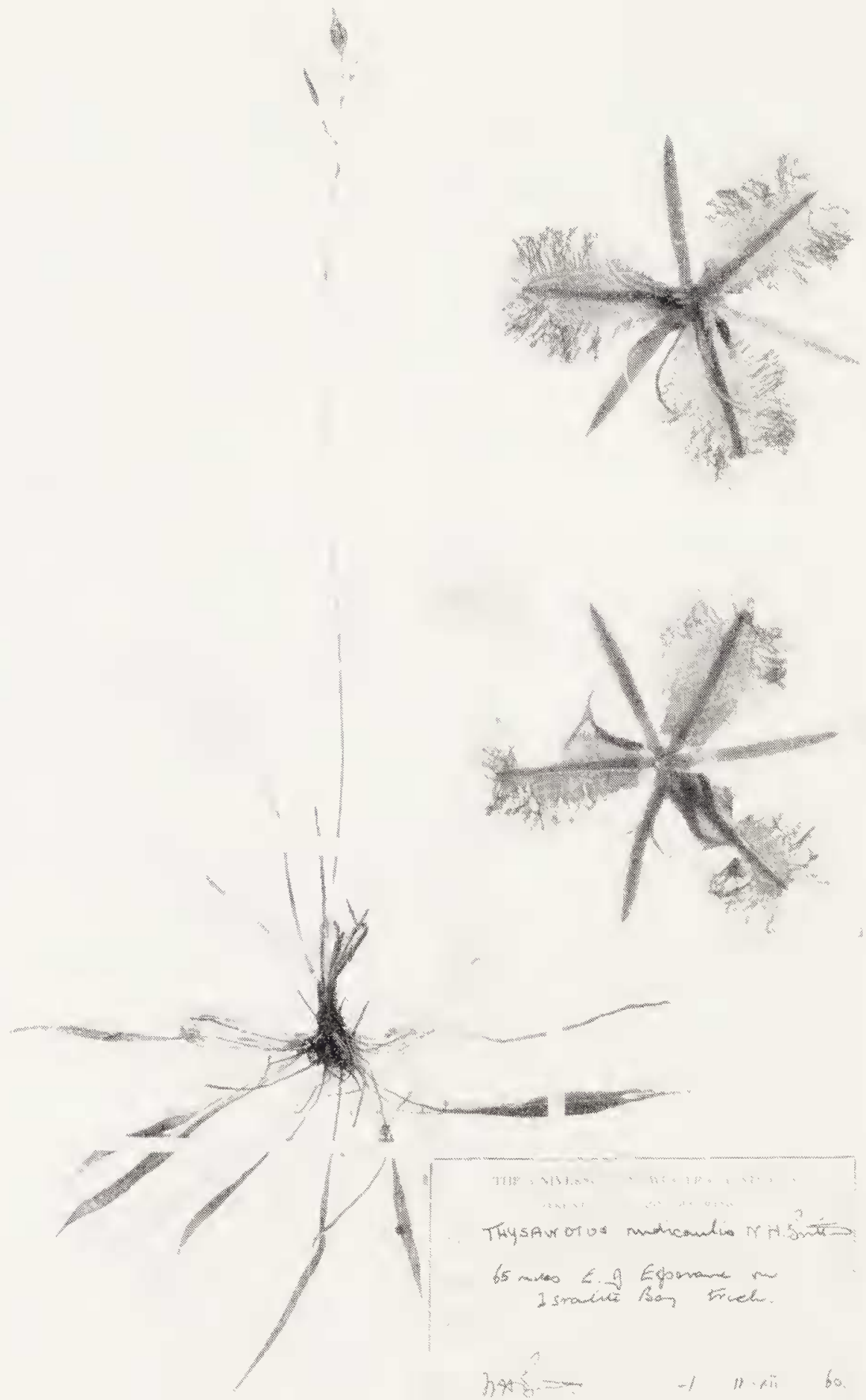


Figure 4.—*Thysanotus nudicaulis* N. H. Britton Holotype: Britton 60/106-1 (UWA), x 0.5; flower x 1.5.



Figure 5.—*Thysanotus nudicaulis* N. H. Brittan—Brittan 60/111-1 (UWA) showing paniculate inflorescence, x 0.5.

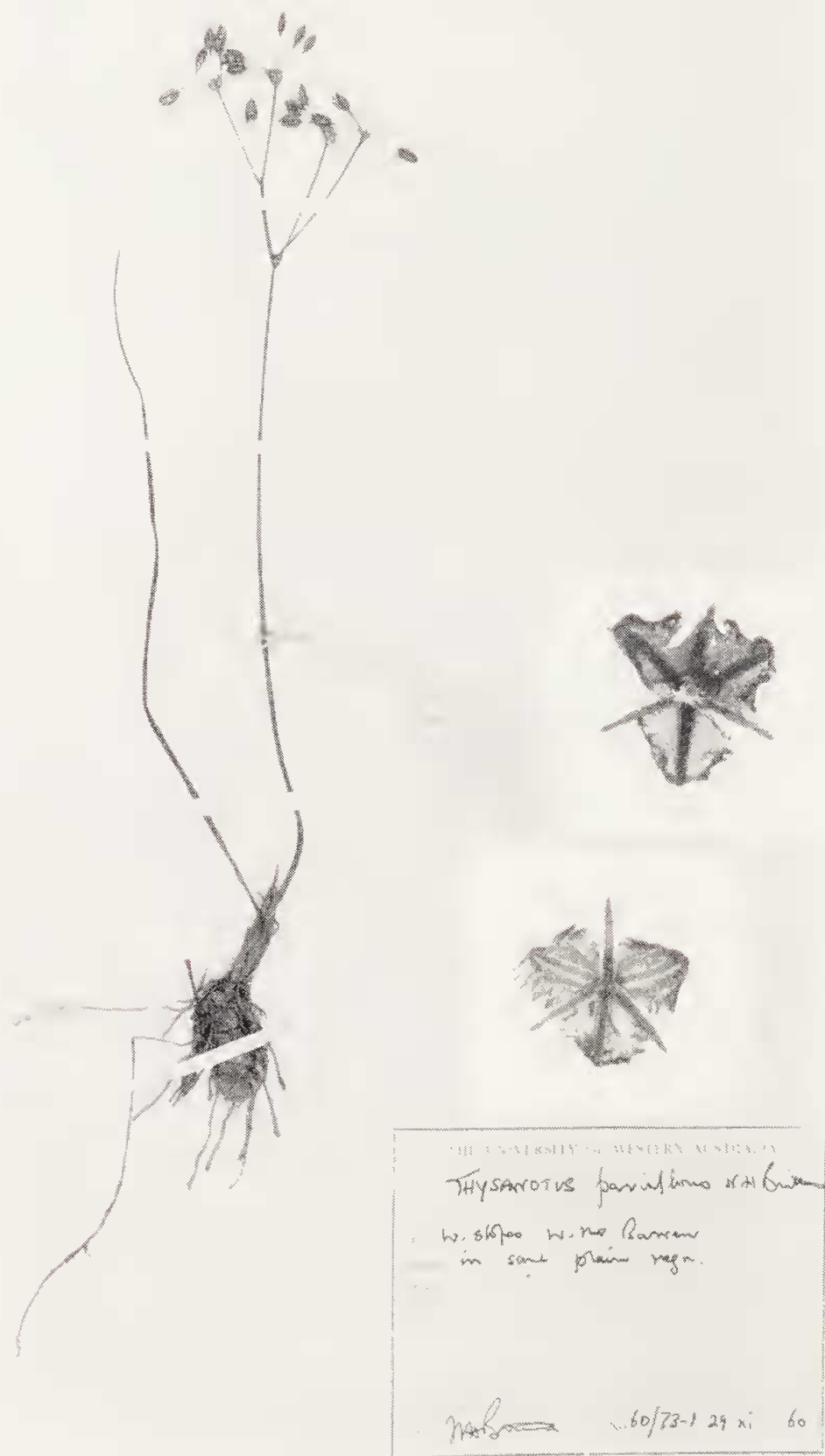


Figure 6.—*Thysanotus parviflorus* N. H. Brittan—Holotype: Brittan 60/73-1 (UWA), x 0.15; flower x 1.5.

nutantibus. Pedicelli 8-10 mm longi, e basi 3 mm articulati. Flores ut in genere. Tepala exteriora linearia, mucronata, 7 mm longa, 1.5 mm lata, anguste membranaceo-marginata; tepala interiora late-elliptica vel circularia, 5-6 mm lata, fimbriis 2 mm longis fimbriata. Stamina 6; antherae purpureae, strictae non tortae, 3 interiores 2 mm longae, 3 exteriores 3 mm longae; filamenta 1 mm longa. Ovarium sessile triloculare, utroque loculo ovulis 2. Stylus terminalis, erectus, strictus, 3 mm longus. Capsula cylindrica 4 mm longa, 2 mm dia., ab perianthio persistenti inclusa. Semina nigra 1.5 x 1.0 mm.

Perennial herb, rootstock small, surrounded by bracts, bases of leaves and stems of previous years' growth. Roots fleshy, 1.5-2.0 mm dia., no signs of tubers in the specimens. Scape and leaves subtended by 1 or 2 membranous bracts ca 4 cm long. Leaves 1 or 2, narrow-linear, terete, glabrous, 10-25 cm long, usually present at flowering time, with membranous bases similar to the bracts. Inflorescence usually one per plant, scape 14-25 cm tall, terete, glabrous, 1-4-branched. Branches 1.5-4 cm long subtended by triangular bract 4-6 mm long with membranous margins. Pairs of closely appressed umbels at apex of scape and 1-3 branches; occasionally one sessile on scape below terminal one. Each umbel enclosed by a \pm broadly ovate-circular bract 3 mm long, acuminate with narrow membranous margins. Inner bracts narrow-ovate, membranous, with distinct purplish veins, projecting at apex. Umbels 4-6-flowered, pedicels erect in flower, nodding in fruit, separating at the articulation at maturity. Pedicels ca 8 mm in flower, 10 mm in fruit, articulation ca 3 mm from base, slightly swollen. Flowers as in the genus. Outer perianth segments 7 mm long, 1.5 mm wide, linear with narrow membranous margins, mucronate; inner perianth segments broad-elliptic to circular, 5-6 mm wide, with 2 mm fringe. Stamens 6; anthers purple, straight, not twisted; inner three 2 mm long; outer three 3 mm long; filaments 1 mm long. Ovary sessile, trilocular, 2 ovules per loculus; style terminal, erect, straight, 3 mm long. Capsule cylindrical 4 mm long, 2 mm wide, enclosed within persistent perianth. Seeds up to 6 per capsule, black, 1.5 x 1.0 mm, with erect funicle and yellow aril ca 1.5 mm long.

This species is reminiscent of *T. chinensis* Benth. in flower size and placement. It differs in having fewer scapes per plant, branched inflorescences with 2-4 umbels per scape, fewer but longer erect leaves and thickened fleshy roots. It also has markedly different distribution.

6. *T. pyramidalis* N. H. Brittan sp. nov.

Holotypus.—65 miles N.E. of Wubin, *Brittan* 58/9-1 11.x.1958 (UWA) (Fig. 7).

Isotypi.—*Brittan* 58/9-2 (CANB), -3 (K), -4 (MEL), -5 (PERTH).

Radices fibrosae fasciculatae, tuberosae. Folia radicularia 6-8, linearia, plana, glabra, 12-16 cm longa, ca 1 mm lata, ante anthesin marcescentia. Scapus 18-30 cm longus, teres, striatus, prope basin hirsutus. Inflorescentia paniculata ramosissima pyramidalis. Bractae nodorum minutae ca 5 mm longae. Umbellae terminales. Umbellae 1-2-florae. Bractae 2, cuneatae, mucronatae, 1.5 mm longae. Pedicelli 3-4 mm longi, basi articulati, erecti. Flores ut in genere. Tepala

exteriora lanceolata 9-10 mm longa, 2 mm lata, membranaceo-marginata, mucronata, valde 3-nervia; tepala interiora elliptica 4-4.5 mm lata, fimbriis ca 1 mm longis fimbriata. Stamina 6; antherae biloculares, introrsum dehiscentes, 3 exteriores ca 3.5 mm longae, rectae, haud tortae; 3 interiores ca 4 mm longae, parum curvatae, haud tortae. Ovarium sessile, globosum, 1 mm latum. Stylus rectus, ca 5 mm longus. Capsula 3 x 2.5 mm. Semina nigra, 1.5 x 1.0 mm.

Roots clustered, tuberous. Leaves radical 6-8, linear, flat, glabrous, 12-16 cm long, ca 1 mm wide, withering near flowering time. Scape 18-30 cm tall, terete, striate, hirsute near base. Inflorescence a much branched pyramidal panicle. Bracts at nodes small, ca 5 mm long. Umbels borne at ends of final branches. Umbels one-, rarely two-flowered. Bracts 2, cuneate, mucronate, 1.5 mm long. Pedicels 3-4 mm long, articulate at the base, erect at both flowering and fruiting. Perianth 9-10 mm long; outer tepals lanceolate, 2 mm wide, with reflexed mucrone, membranous-margined, markedly 3-veined; inner tepals elliptical, 4-4.5 mm wide, fringed, fringe ca 1 mm wide. Stamens 6; anthers bilocular, dehiscing introrsely by slits along the full length; three outer anthers ca 3.5 mm long, straight, not twisted; three inner anthers ca 4 mm long, slightly curved, not twisted. Ovary sessile, globose, 1 mm diameter; style straight, ca 5 mm long. Capsule 3 x 2.5 mm. Seeds black, 1.5 x 1.0 mm.

Discussion:— see after 7. *T. ramulosus*.

Other specimens.—Yandanooka, ca 60 miles S.E. of Geraldton, *Brittan* 60/53, 26.viii.1960 (UWA) and *Brittan* 67/15, 29.ix.1967 (UWA); ca 11 miles W. of Three Springs towards Eneabba, *Brittan* 64/03, 19.ix.1964 (UWA); 20 miles from Geraldton towards Mullewa, *Phillips* 1584, 30.ix.1962 (CBG 025134); Champion Bay, *Oldfield* s.n.; s.d., (MEL); Champion Bay, *Sewell* s.n., 1889 (MEL); Mingenew District, *Campbell* 90, Oct. 1907 (K).

7. *T. ramulosus* N. H. Brittan sp. nov.

Holotypus.—Just N. of crossing of Murchison River by N.W. Coastal Highway, ca 40 miles N. of Northampton, *Brittan* 68/09-1, 8.ix.1968 (UWA) (Fig. 8).

Isotypi.—*Brittan* 68/09-2 (K), 68/09-3 (MEL).

Herba perennis. Caudex parvus, subterraneus, (in solo) 5-18 cm profundus, reliquiis bractearum circumcinctus. Radices fasciculatae, tuberosae, circa 2 cm longae, 4 mm latae, breviter stipitatae. Bractae basales, numerosae, lineares, apicibus obtusis, usque ad 15 cm longae, 2-3 mm latae membranaceae. Caulis singularis, glaber, teres; bractae 1-3, subterraneae, 3-6 cm longae membranaceae, fere ad summum solum attingentes. Caulis aerius aphyllus, teres, glaber vel hirsutus pilis complanatis, sparsis, 1 mm longis. Nodi aerii infimi 1-2 steriles, bracteis deltoideis, apicibus acutis, circa 5-6 mm longis, herbaceis; nodi 3-5 ramis dichotomis sterilibus, glabris vel brevi-hirsutis vel tuberculatis, ad 3 cm longis, bracteis 2.5-3 mm longis, herbaceis vel diluto-purpureis. Rami bracteis patentibus, deltoideis, infimis 4 mm longis, sursum breviter-tuberculatis herbaceis. Rami superiores similes, ad 6-8 cm longi, internodia quam internodia ramorum immatura longiora, umbellis terminati. Umbellae solitariae, bracteis 2, recurvis, late-lanceolatis, apice mucronatis, circa 1 mm longis, herbaceis. Umbellae 1-, raro 2-florae. Pedicelli erecti, 3 mm longi, e basi articulati. Flores ut in genere. Tepala exteriora linearia vel anguste-oblancoolata, 10-11 mm longa, apice acuta, membranaceo-marginata. Tepala interiora elliptica, 5 mm lata, 3-nervata, fimbriis 1.5-2 mm longis



Figure 7.—*Thysanotus pyramidalis* N. H. Brittan—Holotype: Brittan 58/9-1 (UWA), x 0.5; flower x 3.0.

fimbriata. Stamina 6; antherae erectae, basifixae, vix curvatae, non tortae, ventraliter purpureae, dorsaliter luteae, loculi basi breviter divergentes, poris terminalibus dehiscentes. Antherae 3 exteriores 4.5 mm longae, 3 interiores 5 mm longae; filamenta 1 mm longa. Ovarium sessile, cylindricum, triloculare, utroque loculo ovulis 2. Stylus terminalis, strictus, erectus, 5 mm longus. Capsula globosa, 3-4 mm dia. ab perianthio persistenti inclusa. Semina angularia, arillata, nigra, circa 1 x 1 x 1 mm.

Perennial herb. Rootstock small, enclosed by remnants of previous years' bracts, usually 5-18 cm below ground level. Roots clustered, tuberous, ca 2 cm long, 0.4 cm broad, shortly stalked. Bracts basal, several, membranous, linear, apex obtuse, up to 15 cm tall, 2-3 mm wide. Stem usually single, glabrous, terete, bearing underground 1-3 membranous bracts, 3-6 cm long, apices almost reaching ground level. Occasionally an axillary branch grows from one of the upper nodes. Stems above ground leafless, terete, glabrous to hirsute with scattered flattened hairs up to 1 mm long. Nodes above ground: first 1-2 sterile, bracts herbaceous deltoid, apex acute, ca 5-6 mm long. Next 2-3 nodes with sterile dichotomous branches, glabrous to shortly hispidtuberculate, up to 3 cm long, nodal bracts herbaceous to pale purplish, 2.5-3 mm long. Branch bracts patent, deltoid, herbaceous, lower 4 mm long, decreasing above. Upper branches similar, 6- ca 8 cm long, internodes longer, branches terminating in umbels. Umbels solitary with two bracts, the bracts herbaceous, ca 1 mm long, broadly lanceolate, recurved, apex mucronate. Umbels 1-, occasionally 2-flowered. Pedicels erect, 3 mm long, articulate at the base. Flowers as in the genus. Outer tepals linear to narrowly oblanceolate, 10-11 mm long, obscurely 3-veined, membranous-margined, apex acute. Inner tepals elliptical, 5 mm wide, 3-veined, fimbriate, fimbriae 1.5-2 mm long. Stamens 6; anthers basifixae, very slightly curved, not twisted, erect, purple ventrally, yellow dorsally, lobes diverging slightly at the base, dehiscing by terminal pore. Outer anthers 4.5 mm long, inner 5 mm long. Filaments 1 mm long. Ovary sessile, cylindrical, trilocular, 2 ovules in each loculus; style terminal, straight, erect, 5 mm long. Capsule globular, ca 3-4 mm dia., enclosed in persistent perianth. Seeds angular, arillate, black, ca 1 x 1 x 1 mm.

These two species are similar in the form of the inflorescence. *T. pyramidalis* however is larger and more branched. *T. pyramidalis* possesses a separate inflorescence and a number of erect marcescent leaves whereas in *T. ramulosus* there are no leaves but the lower part of the plant has a number of leaf-like dichotomous branchlets. The outer tepals of *T. pyramidalis* are markedly 3-veined, whereas those of *T. ramulosus* are obscurely 3-veined. The anthers of *T. pyramidalis* dehiscence by slits the full length of the loculi; in *T. ramulosus* dehiscence is by a terminal pore.

Other specimens:— Type locality, George 7899, 7.ix.1966 (PERTH); Mileura Station, ca 75 miles W. of Meekatharra, Brittan 70/4, 70/6 and 70/7 (leg. McComb and Mott, 17.viii.1970) (UWA).

3. *T. sabulosus* N. H. Brittan sp. nov.

Holotypus:— Sand plain 17 miles W. of Newdegate on Newdegate-Lake Grace road, Brittan 60/136-1, 15.xii.1960 (UWA) (Fig. 9)

Isotypi:— Brittan 60/136-2 (K), 60/136-3 (MEL), 60/136-4 (PERTH), 60/136-5 (CANB).

Herba perennis, caudex complanato-cylindricus circa 5 mm latus. Radices fibrosae fasciculatae sine tuberculis. Folia basalia, numerosa; extima bractei-formes membranacea 9-10 mm longa, basi 3-4 mm lata; intima plus minusve teretia, 4-5 cm longa, 1 mm lata, basi membranacea-marginata, interjacentia intermedia. Caules numerosi, aphylli, ramosi, aliquot speciminibus plus minusve dichotome-ramosi, teretes, in sicco sulcati, basin versus hirsuti, supra glabrescentes. Bracteae anguste-deltoidae, apicibus obtusae, infimae 10-11 mm longae, summae 2 mm longae. Umbellae terminales, 1-3-florae, bracteae late-deltoidae, 1.5-2 mm longae, intimae membranaceae. Pedicelli erecti, 3-6 mm longi, prope medium articulati. Flores ut in genere. Tepala exteriora anguste-elliptica, anguste membranaceo-marginata, 10-12 mm longa, 1.5-2 mm lata; tepala interiora laminis ovate-ellipticis, 6 mm latis, fimbriis 3 mm longis fimbriata. Stamina 6; antherae atropurpureae, basin versus flavidae. Antherae exteriores strictae, tortae, 4 mm longae; antherae interiores parum curvatae, tortae, 5 mm longae; filamenta 3 mm longa. Ovarium sessile, globosum, triloculare, utroque loculo ovulis 2. Stylus strictus, rectus, 5-6 mm longus. Capsula 3-4 mm longa, ab perianthio persistenti inclusa. Semina nigra, 1.5 x 1 x 1 mm.

Perennial herb, rootstock flattened-cylindrical ca 5 mm dia., bearing series of buds on upper surface. Roots fibrous, no signs of tuberous expansion at distances up to 13 cm from the stock. Leaves several, outermost bract-like, membranous, 3-4 mm wide at base, 9-10 mm long, innermost 4-5 cm long with a \pm terete blade 1 mm wide, with membranous wings at base. A gradual transition between these extremes occurs. Inflorescence of umbels terminating the branches of a paniculate axis. The lower branches often again branched, upper ones simple. Scape terete, ridged when dry, densely covered with short hairs towards base, becoming glabrous above. Bracts subtending branches: lowermost 10-11 mm long, uppermost 2 mm, narrow-triangular, apex obtuse. Umbels 1-3-flowered, bracts 1.5-2 mm long, broadly triangular, innermost with dark vein and membranous lamina. Pedicels 3-6 mm long, articulate at middle, erect in flower and fruit. Flowers as in genus. Outer tepals 10-12 mm long, 1.5-2 mm wide, narrowly elliptical with narrow membranous margins; inner tepals with 3-veined midrib, tapering to acute apex, expanded lamina ovate-elliptical, ca 6 mm wide, surrounded by fringe 3 mm deep. Stamens 6; anthers dark purple with variable amount of yellow towards base, 3 outer anthers straight, twisted, 4 mm long, inner anthers slightly curved, twisted, 5 mm long; filaments of both whorls 3 mm long. Ovary globular, trilocular, ovules 2 per loculus; style straight, erect, 5-6 mm long. Capsule enclosed within persistent perianth parts, 3-4 mm long, dehiscing while on plant. Seeds 1.5 x 1 x 1 mm, black, minutely tuberculate, aril yellow.

In general habit it recalls a new species from New South Wales, *T. virgatus* N. H. Brittan (Brittan 1971) although *T. sabulosus* appears to be usually smaller and more spreading in habit. It differs in the stems being not hairy



Figure 8.—*Thysanotus ramulosus* N. H. Brittan—Holotype: Brittan 68/09-1 (UWA), x 0.5; flower x 3.0.



THYSANOTUS sabulosus N.H. Britton
 17m. W. Nanduyate on L. Grass rd.
 sand plain
 15. x 60

Figure 9.—*Thysanotus sabulosus* N. H. Britton—Holotype: Britton 60/136-1 (UWA), x 0.5; flower x 2.0.

throughout and in the absence of broad (3.5-5 mm wide) outer tepals, prominently 7- (occasionally 6-) veined on the outer surface.

Other specimen.—3 miles E. of Lake Grace township on Lake Grace to Newdegate road, *Brittan* 60/137, 15.xii.1960 (UWA).

9. *T. speckii* N. H. Brittan sp. nov.

Holotypus.—20 miles N.W. Belele Station, ca 30 miles W.N.W. of Meekatharra, *Speck* 635, 5.ix.1957 (CANB 81373).

Isotypus.—*Speck* 635 (AD 6001029).

Herba perennis, caudex parvus. Radices fasciculatae, tuberosae, cylindricae, 2.5-3.5 mm longae. Bractae radicales 1-2, apice acutae, 3-4 cm longae, membranaceae. Folia radicalia, 1-4, supra linearia, basin versus membranaceo-marginata semi vaginaria, 12.5-25 cm longa, in margines et raro supra nervis pilis tuberculatis; interdum ante anthesin marcescentia. Inflorescentia paniculata laxa, Umbellae terminales, 4-6 florum, bractae late-deltoidae, 2.5 mm longae, manifeste nervatae membranaceae. Pedicelli 5-12 mm longi, prope medium articulati, florentes erecti, fructiferi nutantes. Flores ut in genere. Tepala 6; 3 exteriora linearia vel anguste-lanceolata, anguste membranaceo-marginata, 5-12 mm longa, circa 2.5 mm lata; 3 interiora oblongo-elliptica, 3.5-4 mm lata, fimbriis 1.5-2 mm longis fimbriata. Stamina 6; antherae strictae, basifixae, non tortae, rimis introrsis dehiscentes; loculi basi breviter divergentes, antherae 3 exteriores 4 mm longae, 3 interiores 5 mm longae; filamenta 1.5-2 mm longa. Ovarium sessile, plusminusve globosum, utroque loculo ovulis 2. Stylus terminalis, curvatus, stamina aequans. Capsula cylindrica, circa 5 mm longa, ab perianthio persistenti inclusa. Semina nigra.

Nominavi hanc speciem in memoriam Nathaniel Speck, qui specimina prima lectavit.

Perennial herb; rootstock small; roots tuberous, cylindrical, 2.5-3.5 cm long, clustered close to stock. Leaves and inflorescence enclosed by one or two membranous-edged bracts 3-4 cm long with acute tips, sometimes coloured usually just above ground level. Leaves with membranous-edged sheathing bases similar to sheathing bracts, extending into \pm linear, flat lamina, ca 12.5-25 cm long. Leaf margins with tuberculate hairs, in some specimens also occurring over veins on lamina; in some specimens leaves marcescent before flowering. Inflorescence a loose panicle, frequently with additional branches arising from axils of main branches. Bracts on rachis 6-10 mm long, narrow-deltoid with membranous wings near base, bracts on rachillae similar but smaller. Umbels terminal, ca 4-6-flowered, umbel bracts 2.5 mm long, broad deltoid, membranous, with prominent veins. Pedicels 5-12 mm long, articulate about middle, erect in flower, nutant in fruit. Flowers as in genus. Perianth segments 5-12 mm long; outer tepals linear to narrow-lanceolate, ca 2.5 mm wide at base, narrow membranous-edged, inner tepals oblong-elliptical, ca 3.5-4 mm wide with fimbriae 1.2-2 mm long. Stamens 6; anthers straight not twisted, dehiscing by slits the full length of the anther, almost basifix, loculi projecting as two lobes ca 0.5 mm beyond filament; anthers of outer stamens 4 mm, of inner stamens 5 mm long. Ovary sessile, \pm globular; style terminal, curved, \pm as long as anthers. Capsule cylindrical, ca 5 mm long, enclosed within persistent perianth parts. Seeds up to 6 per capsule, black with finely reticulate testa.

Named in memory of the late Dr. Nathaniel Speck, friend and former colleague, who made the first collection.

Distinguished from almost all other *Thysanotus* species in its flowers with inner tepals oblong in shape with very short fimbriae and the outer tepals fully recurved in flower. Both these characters recall the Eastern Australian species *T. baueri* R.Br., from which it differs in possessing straight anthers all more or less equal in length and not twisted, compared with *T. baueri* which has twisted anthers, the two whorls of three markedly dissimilar in length.

Other specimens.—Bernier Island, Shark Bay, *Royce* 6011, 23.vii. 1959 (PERTH); Carnarvon Highway, W.N.W. of Woodleigh Station, ca 110 miles S.S.E. of Carnarvon, *Burbidge* 6477, 2.ix.1959 (CANB 167717) (PERTH) (Fig. 10), same locality *Brittan* 60/50, 23.viii.1960 (UWA) (Fig. 10, flower); 22 miles E. of Gascoyne Junction, *Lindgren*, s.n., Sept. 1964 (PERTH); Beringarra Station, ca 100 miles W.N.W. of Meekatharra, *McComb* s.n. 20.viii.1963 (UWA); Mileura Station, ca 75 miles W. of Meekatharra, *Brittan* 70/5, leg. *McComb* and *Mott*, 17.viii.1970 (UWA); N. of Murchison River crossing on N.W. Coastal Highway, ca 40 miles N. of Northampton, *Brittan* 70/10, 25.viii.1970 (UWA); nr. Diemal Find, ca 60 miles N. of Bullfinch, *Brittan* 70/16, leg. *Beltran*, Aug. 1970 (UWA).

10. *T. teretifolius* N.H. Brittan sp. nov.

Holotypus.—Eneabba-Dongara road, ca 18 miles N. of Eneabba, *Brittan* 68/17, 21.x.1968 (UWA) (Fig. 11).

Paratypes.—Eneabba—Dongara road, ca 20 miles S. of junction with Geraldton Highway, *Brittan* 68/20, 21.x.1968 68/20-1 (K), 68/20-2 (MEL).

Herba perennis. Caudex parvus. Radices fibrosae fasciculatae, haud tuberosae. Folia radicalia, alterna, usque ad 10, linearia, teretia, siccitate \pm striata acuminate, 12-20 cm longa, 1-1.5 mm lata, basin versus vaginis latis, membranaceo-marginatis, costatis, 5-8 mm latis expansa vetuste, caules novi axillis foliorum veterum exorientes. Inflorescentia surculorum plerumque solitaria, 24-30 cm alta. Scapus teres, simplex, 1-2 bracteis sterilibus vel 1-2-ramosis. Bractae deltoidae, 10-15 mm longae, herbaceae vel purpureae. Ramuli 1-2 spicis condensatis terminati. Bractea spicae exterior, late-lanceolata, membranaceo-marginata, circa 6 mm longa, herbacea vel purpurea. Bractea spicae interiores, lanceolatae, linearatae, acutae, 5-6 mm longae, membranaceae. Pedicelli 11-12 mm longi, e basi 4-5 mm articulati, florentes erecti, fructiferi nutantes. Flores ut in genere. Tepala exteriora anguste-lanceolata, anguste membranaceo-marginata, mucronata, 11-12 mm longa, 2 mm lata. Tepala interiora elliptica, 6-7 mm lata, fimbriis ca 4 mm longis fimbriata. Stamina 3, antherae declinatae, basifixae, purpureae, deltoidae, curvatae, parum tortae, loculi basi breviter divergentes, poris terminalibus dehiscentes; filamenta ca 1 mm longa. Ovarium sessile, \pm globosum, triloculare, utroque loculo ovulis 2. Stylus terminalis, declinatus, curvatus, ca 5-6 mm longis. Capsula ab perianthio persistenti inclusa. Semina nigra, arillata.

Perennial herb. Rootstock small. Roots clustered, fibrous, not tuberous. Leaves basal, alternate, up to ca 10, linear, terete, \pm striate on drying, acuminate, 12-20 cm long, 1-1.5 mm wide, expanding towards the base into broad, membranous-margined ribbed bases, 5-8 mm wide. In older plants new shoots arise from

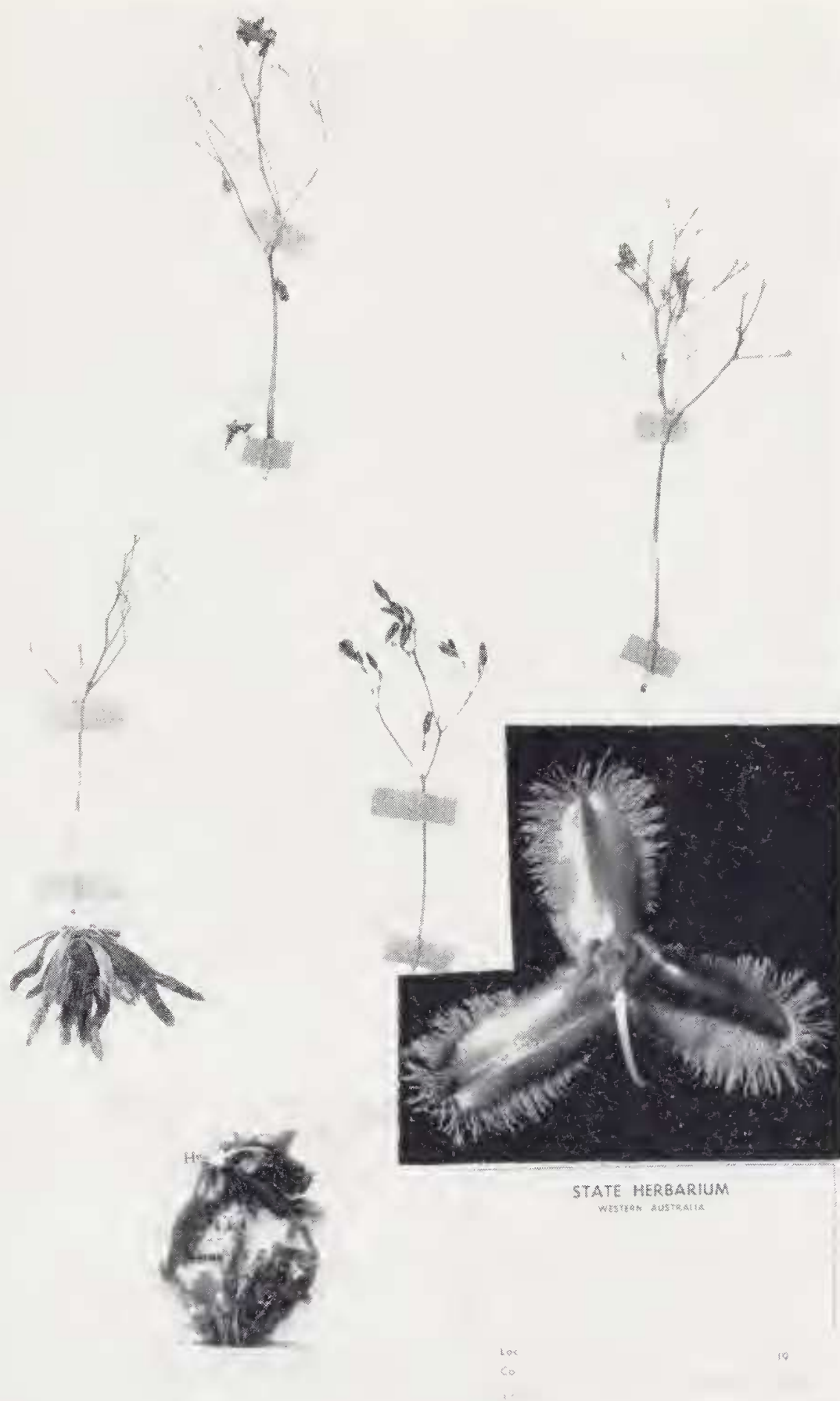


Figure 10.—*Thysanotus speckii* N. H. Brittan—Paratype: Burbidge 6177 (PERTH), x 0.5; flower from Brittan 60/50 cult. (x ca 3.0).

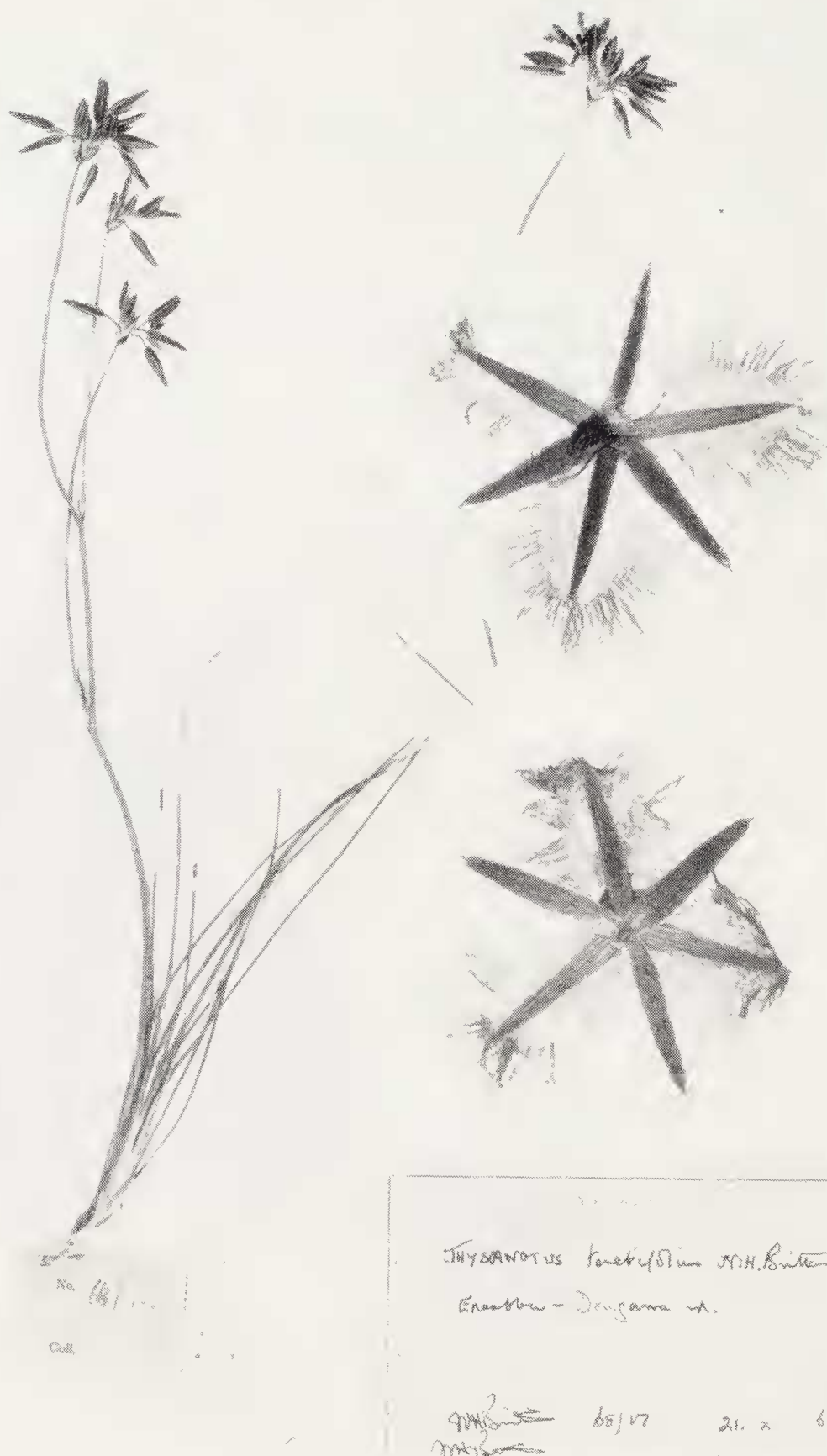


Figure 11.—*Thysanotus teretifolius* N. H. Britton—Holotype: Brittan 63/17 (UWA), x 0.5; flower from Brittan 67/21 (UWA) (x 1.8).

the axils of the old leaf bases. Inflorescence usually one per shoot, 24-30 cm tall. Scape terete, simple, with 1-2 sterile bracts or once to twice branched. Bracts herbaceous—purplish, deltoid, 10-15 mm long. 1-2 condensed spikes terminating the branches, enclosed by broad lanceolate bract, membranous-margined, herbaceous—purplish, ca 6 mm long. Bracts one per flower, lanceolate, membranous, 1-veined, acute, 5-6 mm long. Pedicels 11-12 mm long, articulate 4-5 mm from base, erect in flower, nutant in fruit. Flowers as in genus. Outer tepals narrow-lanceolate, narrowly membranous-margined, mucronate, 11-12 mm long, 2 mm wide. Innertepals elliptical, 6-7 mm wide, fimbriate, fimbriae ca 4 mm long. Stamens 3; anthers purple, deltoid, basifixed with loculi projecting at base, declinate, curved, slightly twisted, dehiscing by terminal pore; filaments ca 1 mm long. Ovary sessile, \pm globular, trilocular, 2 ovules per loculus. Style terminal, curved, declinate, ca 5-6 mm long. Capsule enclosed within persistent perianth segments. Seeds black, arillate.

This species resembles some specimens of *T. multiflorus* R.Br. with which it has in common terminal 'umbels' (contracted spikes) of flowers with three stamens. It differs in the terete leaves and in the more frequent occurrence of branched scapes and in the pedicels bending downward as the capsules develop.

Other specimen.—Badgingarra-Eneabba road, ca half mile S. of Jurien Bay turn off, *Brittan* 67/21, 30.ix.1967 (UWA) (flower material only).

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References

- Baker, J. G. (1877).—*J. Linn. Soc. Bot.* 15 : 253.
 Bentham, G. (1861).—*Flora Hongkongensis*. Reeve, London 372.
 ——— (1878).—*Flora Australiensis* 7 : 36. Reeve, London.
 Brittan, N. H. (1960).—*J. Roy. Soc. W. Austral.* 43 : 10-29.
 ——— (1971).—*Contrib. N.S.W. Herb.* (in press).
 Brown, R. (1810).—*Prodromus Florae Novae-Hollandiae* : 282 Hafner, N. Y. (repr.).

